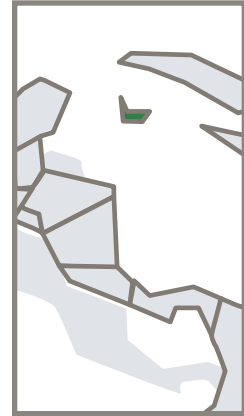


REGIONAL EVALUATION MUNICIPAL SOLID WASTE MANAGEMENT SERVICES



COUNTRY ANALITICAL REPORT CAYMAN ISLANDS / EVALUATION 2002

OCTOBER 2003



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1. EXECUTIVE SUMMARY

The Cayman Islands has experienced a significant growth in population over the past two decades and with exponential growth in waste production. The islands industry and commercial activities have all lent itself to these increases and the George Town Landfill, which was a typical example of the old dumping and burning practices, has been rendered obsolete with the introduction of the sanitary landfill.

The resident population of the Cayman Islands on Census night stood at 39,410 of which 390 were institutionalized. The number of households in the Cayman Islands increased to 14,907 in the 1999 Census from a total of 8,115 in 1989. George Town, the capital has 20,626 persons and Cayman Brac / Little Cayman 1,937 persons, combined.

A waste audit undertaken during the months of May to September 1999 established the annual disposal rate for the base year to be 44,000 tons. The George Town landfill was expected to reach capacity in February, 2002 (Alternative Systems Analysis - Solid Waste Feasibility Study for Grand Cayman, 2001). Later, the Waste Disposal Options Review Committee (WDOR) estimated that the existing George Town Landfill will reach full capacity by mid 2005. Several alternatives are available for the continuing disposal of Municipal Solid Waste (MSW) on the island. Composting and Waste to Energy (W-T-E) are disposal options that offer the potential of diverting a portion of the waste stream away from the landfill. However, neither of these alternatives can fully supplant the need for a new landfill and transfer station. There will always be a portion of the waste stream that will require landfill disposal whether it is non-compostable material, non-combustible material, incinerator ash, or C&D.

A regularity and efficiency of collection has been achieved over the past two years through the replacement of vehicles and better management practices. Curb side waste collection services are provided by the Cayman Islands Department of Environmental Health (DEH). Residential waste is collected on all three islands with the use of rear loading compactor vehicles. Each route has a schedule for twice-per-week collection. Commercial waste collection is accomplished through container through container rental and servicing. Tipping fees are not currently charged at the landfills; however annual garbage fees are due and payable by January 15th each year to the Cayman Islands Government.

The following materials are prohibited in standard residential or commercial collection programs: hazardous and / or combustible materials such as gasoline or motor oil, dead animals, biomedical waste such as syringes, infectious materials or sewage, bulky waste or drums of liquid.

The Cayman Islands has been involved in various forms of recycling for many years. The Recycling area at the George Town Landfill prepares and ships the following materials overseas: lead acid batteries and waste oil, aluminium cans, office paper and other materials such as natural Christmas trees are chipped in early January and free yard mulch is offered to residents. Time and locations are announced each year.

The landfill in George Town, Grand Cayman is located on a 58 acre, government-owned parcel of land, opened from 4:00am to 7:00pm Monday to Saturday. A public drop off area is open 24 hours a day for small loads only. Waste is disposed of in Cayman Brac via a landfill located on the south side of the island, opposite the public beach and open to the public from 9:00 am to 5:00 pm Monday to Saturday. On Little Cayman, the landfill is open to the public from 7:00 am to 5:00pm Monday to Saturday.

Biomedical waste is collected separately and incinerated in the multi-purpose waste incinerators on Grand Cayman and Cayman Brac. An appointment must be made for incineration of any other materials (e.g. confidential documents) prior to arriving at the landfill. Biomedical waste generators are required to be licensed.

Large, bulky items such as bicycles, couches, tires and old appliances are not collected as part of the residential and commercial waste collection service. These items are taken to the landfill for safe disposal. The DEH offers special bulk waste clean up campaigns which are advertised in the newspaper and on radio.

Despite the fact that a significant amount of improvement has taken place over the years in the solid waste management sector, that is still a long way to go and the Government through the Department of Environmental Health (DEH) endeavours continue to its efforts to creating a clean environment and a citizenry committed to a similar objective, through a sustained public education programme.

2. INTRODUCTION

The world has been experiencing an unforeseen explosion in population growth coupled with globalisation, technological advances and increased migration, which is resulting in heightened consumerism. Concomitantly, the increase in solid waste since the last decades is unsurpassed and the focus is now on governments and local authorities' abilities to innovatively manage solid waste and efficiently reduce and dispose of waste.

Latin American and Caribbean countries face more complex challenges as they are often limited by the unavailability of adequate funding, cultural (local) barriers and the inability to enhance cost recovery mechanisms. Notwithstanding, owing to the correlation between environmental health and solid waste management practices as per disease prevention, safeguarding of groundwater (drinking water) systems and sanitation matters, it is imperative that a proactive approach be taken by these countries as the economic cost to deal with epidemics is far greater.

In the 1960s, the Cayman Islands' Government after realizing that the population had grown at such a high rate leased a 20-acre parcel of land, for the purpose of a more formal solid waste disposal. Prior to the 1960's population explosion, refuse was generally burned or buried in people's yard or dumped in out-of-the way places. With the government intervention dumping and open burning was stopped due to the environmental concerns over smoke and air pollution. However there are no liner system under the solid waste in the landfill and contamination from the solid waste (leachate) can migrate through the groundwater to contaminate the environment. The situation was not helped as the population growth continued; an exponential growth was also seen in tourism and condominium development. In 1990, the Government became concern about the environmental threat from the landfill, the unknown future costs and land needs for the solid waste disposal.

Since then the Government has commissioned an in-depth study (Post, Buckley, Shah and Jernigan, Inc. - 1992), Environment Impact Assessments and convened a Waste Disposal Options Review Committee (WDOR). Covering of the landfill occurs to reduce vector transmission, streamlining of the landfill is also taking place and a suitable site is being sought with the intention to operate that as a sanitary landfill using engineering methods.

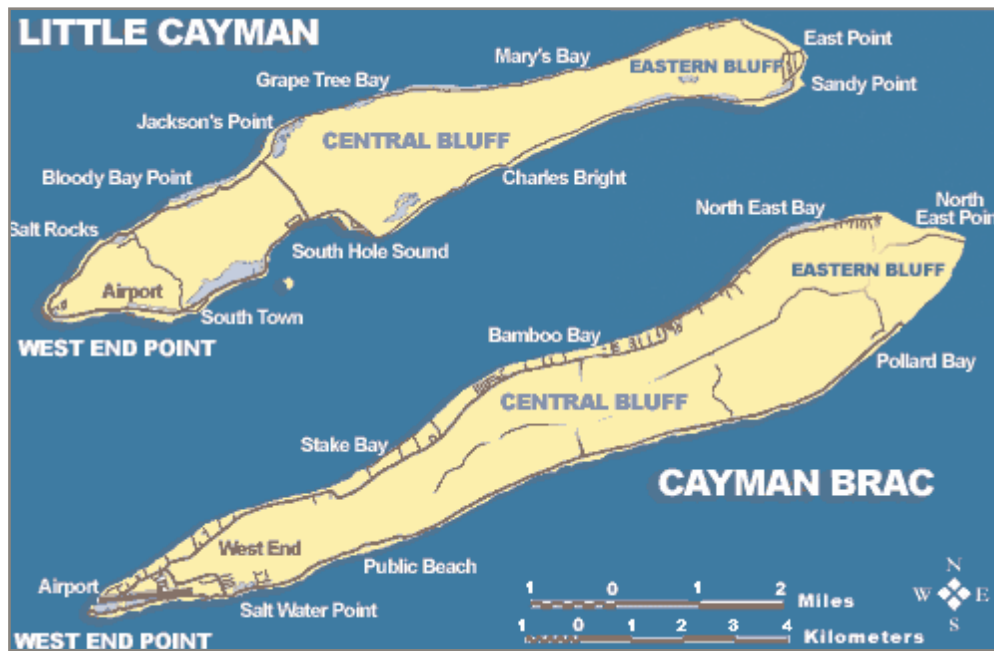
The islands, though separated, operate along the same lines as regards solid waste management services. The Department of Health (DEH) has worked continuously with consultants, on inter agency level and with the wider society to have a hybrid integrated solid waste management system. Additionally, the Department has been making progress in implementing some of the strategies and recommendations brought out by the various studies. Some of these include equipment procurement and instituting a waste processing facility to recycle some non - biodegradable materials.

Evaluation 2002 will be another way by which the sector can be inventoried and some of the activities that occurred in the evaluation period 1996-2001 can be highlighted that will continue to assist the Government to maintain its focus and also enable greater involvement by external entities in the process.

THE CAYMAN ISLANDS



Map A: Grand Cayman



Map B: Cayman Brac and Little Cayman

3. BACKGROUND

General Characteristics

The Cayman Islands comprises Grand Cayman, Cayman Brac and Little Cayman. The three islands situated in the Western Caribbean lie between 19° 15' and 19° 45' North and between 79° 44' and 81° 27' West and over 1000 miles west of the US Virgin Islands and the Leeward Island chain.

Grand Cayman the largest of the three islands is approximately 22 miles long with an average width of four miles, George Town, the capital is also located here. Of its total area, 78 sq.miles, almost half is wetland. The island is low lying; with the highest point only about 60 feet above sea level. Cayman Brac lies about 89 miles northeast of Grand Cayman. It is about 12 miles long, with an average width of 1-¼ miles. Little Cayman lies five miles west of Cayman Brac and is approximately ten miles long with an average width of just over a mile. The island is low lying with a few areas on the north shore rising to 40 ft. above sea level. Together, the islands have a land area of about 100 sq. miles. There are no rivers on any of the islands, but there are large areas of luxuriant vegetation. The coasts are largely protected by offshore reefs and in many places by a mangrove fringe that often extends into inland swamps that play a key role in the islands' ecology. The National Trust for the Cayman Islands protects almost 2,000 acres of dry forests and mangrove wetland. An internationally acclaimed system of marine parks is managed by the Department of Environment.

The population of the islands at the last census taken, in 1999, was 39,410, of whom 53 percent were Caymanian. 2000's estimated population was 40,900. Of the 14,908 households in the islands in 1999, 45 percent were owner-occupied.

The main industries are financial services, tourism and real estate sales and development. Service industries, such as construction, jewellery manufacture, hotel and restaurant operations, retail trades, scuba diving and boat rentals are ancillary to the main industries. The island is as much a world-class scuba diving and snorkelling center as it is an offshore, tax-free banking mecca. There are no sales taxes, payroll taxes, property taxes or taxes on gasoline.

Solid Waste Management on the island is under the jurisdiction of the Department Of Environmental Health. Grand Cayman Island disposes of their solid waste in a sanitary landfill at a site owned and operated by the Cayman Island Government. The landfill is located in George Town in an area zoned for heavy industry, and occupies an area of 58 acres.

In the Cayman Islands, the Human Development Indicators (HDI) - a composite index measuring average achievement in three basic dimensions of human development - a long, healthy life, knowledge and a decent standard of living, are as follows:

- The adult literacy rate is about 98%
- The average infant mortality rate during the 1992-1995 period was 8.6 per 1000 live births
- Gross Domestic Product (GDP) per head is US \$25,000; the currency is the local Cayman Islands dollar. US \$ is readily accepted at a steady exchange rate of US\$1= CI \$0.80

The Evolution of the Solid Waste Management Services in the last 10 years

In the early 1990s the Government of Cayman became concern with the environmental threat from the land-fill, and the unknown future costs and land needs for solid waste disposal. At the time, the Government called for proposals from consulting engineers to help the Environmental Health Section assess the environmental

damage done by the landfill, review operational problems, plan a modern solid waste management facility, determine the costs and long term land requirements for solid waste disposal over a twenty year period, and prepare a conceptual end use plan for the site when the site is no longer used as a landfill. It was decided to start the 20-year planning period in June 1993 ending in 2013.

Residents pay no taxes and the Department of Environmental Health acquires limited revenue through the charging of an annual service charge. Currently the George Town Landfill does not charge any tipping fees whatsoever. However significant investment, at an annual average of CI \$5 million (approximately US\$4 million) is injected into solid waste management services which includes capital and recurring expenditure. Equipment such as biomedical and multi purpose waste incinerators on Grand Cayman and Cayman Brac to collect and dispose of biomedical waste separately and recycling equipment such as balers were procured to process lead acid batteries, waste oil and aluminium cans for shipment overseas.

Closer attention has been given to the various types of waste and also attempts made to separate waste by type and nature especially domestic waste prior to landfilling. A major strategy employed has been to endeavour to reduce the volume of waste that is finally disposed of at the George Town Landfill and / or the landfill on the other islands; this is owing to the fact that land is limited and an indefinite supply of landfill area does not exist (See Table 1).

Table 1: Major Waste Types entering George Town Landfill

Description	Percent
Residential	35.5
Business	30.1
Yard Waste	15.9
Construction / Demolition	15.0
Recyclable Materials	1.9
Public Drop - off	1.0
Biomedical	0.3
Other	0.3
Total	100.0

4. ORGANIZATIONAL STRUCTURE OF SOLID WASTE MANAGEMENT SERVICES

The Cayman Islands are a British overseas territory with a Governor appointed by the Crown. In 1994 a constitutional amendment introduced a new ministerial form of Government; the five elected members of Executive Council are now called Ministers. The Environmental Health Department, under the portfolio of the Ministry of Planning, Communication, Works and Information Technology has the responsibility for the collection, transportation and disposal of solid waste in the Cayman Islands.

Enforcement Authority

The current statutory framework empowers government to manage and deliver all aspects of Municipal Solid Waste (MSW) collection, processing and disposal. Although several environmental initiatives exist, including portions of Vision 2008, the Cayman Islands have no national environmental management program. The Public Health Law (1996 Revision), the Public Health (Garbage and Refuse Disposal) Regulations (1999 Revision), and the Litter Law (1997 Revision) confer enforcement authority to the Chief Environmental Health Officer in the majority of Municipal Solid Waste (MSW) management matters (e.g. nuisance abatement, collection systems, littering) and the Chief Medical Officer in others (e.g. quarantine and infectious waste).

Environmental Legislation and Regulations

The Public Health Law and its accompanying regulations are the only legal framework for Municipal Solid Waste (MSW) management in the Cayman Islands. The Law and Regulations address MSW collection but are silent on MSW processing and disposal. Hazardous waste management and disposal regulations are also lacking.

Human resources education

Careers in solid waste management are promoted at local career fairs. The public education and promotions officer of the Department of Health (DEH) also research for opportunities in further training of staff or attendance to informational environmental health conferences.

Collection Systems

Curbside waste collection services are provided by the Cayman Islands' DEH to residences Grand Cayman, Cayman Brac and Little Cayman. Rear loading compactor vehicles with three men crews, one driver and two collectors, are used for single-family residences and small, multi-residence dwellings. Each route area has a schedule for twice per week collection. Residents are asked to place their curbside the night before, into hard shell garbage containers with well-fitted lids, thus preventing access by stray animals. Each bag or container should not exceed 40 lbs in weight and sharp objects such as pieces of metal or tree branches should not protrude from any bags or containers.

Commercial Waste Collection

Is accomplished through container rental and servicing. Several sizes and types of containers are available and can be rented on a daily, monthly or annual basis. The servicing frequency can be arranged from once per month to six days per week. Some small businesses, such as restaurants and apartment buildings, can only be serviced with rear loading containers due to space constraints. These containers are collected as part of the residential collection service.

Annual garbage fees are due and payable by January 15th of each year to the Cayman Islands Government. Invoices are also mailed to residents each year by DEH and may be paid by mail, at district post offices or business offices on Grand Cayman or Cayman Brac. Daily container rentals can be arranged by visiting the business office in Grand Cayman. *See illustration below.*



Illustration One: 2 yards Front Loader



8 Cubic yards Front Loader

Recycling - The Cayman Islands has been involved in various forms of recycling for many years. The Recycling area at the George Town Landfill prepares and ships the following materials overseas: aluminium cans, office paper lead acid batteries and waste oil. Other materials such as natural Christmas trees are chipped in early January and free yard mulch is offered to residents.



Recycling area shredder

The Interim Report of the Waste Disposal Options Review Committee (WDOR) for the management, collection, treatment and disposal of municipal solid waste in the Cayman Islands made the following recommendations and observations:

- The existing George Town Landfill will reach full capacity by mid 2005.
- A reasonable estimated time for a new treatment and disposal facility to become fully operational is early 2006.
- The selected technology for treatment and disposal of waste is a hybrid system comprising:
 - (a) A waste-to-energy system
 - (b) Composting of the yard waste
 - (c) Shredding of used tyres
 - (d) Recycling (aluminium, ferrous materials, waste oils, lead-acid batteries)

- Disposal of mainly biologically inert materials (glass, plastics, building rubble) on a properly engineered landfill.
- The new waste treatment and disposal facility will be located at and adjacent to the present site of the George Town Landfill.
- Re zoning of additional and acquired land adjacent landfill.
- Legislation to be drafted and passed to establish a Solid Waste Authority (SWA) with the duty to manage the collection, treatment and disposal of solid waste.
- The existing garbage fee structure to be abandoned and the SWA's expenditure to be covered by a waste disposal fee on imported goods, the Economics Research Unit will be tasked to work out a proper fee structure.
- The applicable United States Environmental Protection Agency emission standards are to be adopted as baseline environmental standards.
- The waste treatment / disposal system is to be acquired under a lease to purchase agreement.
- The pre-qualified companies will bid on this project in accordance with country tenders guidelines.
- The WDOR Committee will review return tenders and make recommendations to the Central Committee for contract awards.
- Selection of treatment and disposal for the Sister Islands will be determined after a final decision has been made for Grand Cayman.

5. SITUATION OF THE DELIVERY OF MSWM SERVICES AT THE LOCAL LEVEL

Analysis of the quality and coverage of collection, transportation and final disposal in small population nuclei. Per capita solid waste generation rates are moderate at 1.1 kg/person/day. Residential waste is collected six days per week on a three day repeated schedule. The entire island is collected from Monday to Wednesday by running five routes on each day (five crews and trucks). This collection is repeated Thursdays to Saturdays by running four routes to complete the cycle twice weekly. On additional route is included each day to collect the small, less accessible streets and to collect the many litterbins located throughout Grand Cayman. In addition, one of the residential routes is scheduled everyday to collect bagged waste from the George Town area to ensure that the busiest trade and tourist area is clear of waste.

Some commercial waste is collected as part of the residential collection system through the servicing of rear loading containers at small businesses such as small apartment complexes located on residential routes. It is estimated that this commercial component of the residential collection service involves the equivalent of one route per day, or approximately one fifth of the residential collection resources.

The DEH is currently striving to improve the efficiency of the collection system by replacing residential bins at existing large condominium or apartment complexes with commercial containers wherever practical. The routing system employed is termed "are routing," in that the collection foreman and drivers are responsible for ensuring the routes are collected in an efficient manner, but the routes are not specified in terms of every stop and turn.

Cost analysis and rates for delivery of service Cayman Islands have developed steadily over the last five decades and from all indication this will continue. The DEH staff estimates total quantities received at the George Town Landfill in 1999 to be 44,000 tons of municipal solid waste (MSW) per year. The current revenue system for residential waste is an annual fee levied per household: CI \$100 (US\$80) per home, apartment or condominium (and a proposed \$300 (US\$240) per home, apartment or condominium located on waterfront parcels between the West Bay Cemetery and the Wharf Restaurant). It is important to note that this is a fee, not a unit-based price for the specific amount of waste generated per household.

This annual fee is applied toward the operational and maintenance costs of twice-per-week curbside collection and disposal of residential waste. The 1999 cost per ton for residential collection, exclusive of capital equipment, was approximately CI \$95.08 (US\$76).

The current revenue system for commercial/ institutional waste consists of a combination of: (a) an annual container rental fee based on the size of the container; (b) a fee based on the size of the establishment; and (c) varying service fees based on the frequency of collection. As with residential fee, it is important to note that this is a fee, not a unit-based price for the specific amount of waste generated per establishment. The fee appears to be designed according to a general principle that the larger the business, the larger the waste generation volume. The fee was also designed to accommodate daily collection of putrescible waste, such as food waste from restaurants, no doubt due to tropical climate conditions.

This annual fee is applied toward the cost of collection and disposal of commercial waste. The 1999 cost per ton for commercial/institutional collection, exclusive of capital equipment, was CI \$32.50 (US\$26.0).

The cost of waste disposal, not including capital costs, in 1999 was CI\$16.11 (US\$12.88). This cost is in addition to the collection costs above for commercial and residential waste and includes the disposal of MSW delivered by private residents and businesses directly to the landfill at no charge.

Unit based pricing is currently utilized only for biomedical waste (per-pound price), daily container rentals (per-service price) and grab truck service (per -trip price).

Municipal development and its relation to Solid Waste Management. Cayman Islands have developed at the pace of North American small centers. The centrally located landfill which was commissioned out of a realization of the increasing population and converse greater volume of solid waste generation, the George Town Landfill is reported to take in 100 tons of refuse daily, a rate that is purported to be increasing by 25 percent per year.

Space is limited and the need for another landfill competes with other needs such as housing demands which are bound to increase with time, other technologies are utilized by the CI Government, which are more protective of the environment and have less nuisances.

The alternatives to landfill and reducing waste at source methodology include; at the community level, sorting waste, placing them by type in specifically marked bins/receptacles, which are picked up and directly taken to the landfill. Recycling programs in the Cayman Islands have grown significantly during the last few years to include a long list of items. Car batteries, used oil, derelict cars, cardboard, white paper and scrap metal to name a few are loaded onto shipping containers and sold to brokers throughout North and South America.

Recycling programs are not only deemed as a thing to do but something that must be done. The inability to dig on the island without hitting water has made burial impossible so the trash has been built up to levels equal to the highest point on the island, 45 feet. A number of changes have taken place that resulted in curtailing a large part of illegal dumping, and a successful recycling program. Additionally, the current recycling programs will require expansion as the volumes of recyclable materials collected increase. It is anticipated that even with the W-T-E alternatives, it will be beneficial to continue the recycling of waste oil, derelict vehicles, scrap metal, lead - acid batteries, aluminium, glass and certain types of paper if markets exist for these materials.

It is proposed that the with the current trend in population growth solid waste quantities to be managed by the alternative system selected during the 20 year planning period, ending 2021, using 44,000 tons of MSW in 1999 as a base year and a 5% annual growth rate for subsequent years will reflect the following, highlighted in Table 2 below.

Table 2: Municipal Solid Waste Volumes for Planning Period

Plan Years	Calendar Year	Annual Quantity MSW (Tons)	Compost Organic 27%	Construction Debris 15%	Combustible Waste - to - Energy 58%
1	2002	50,936	13,753	7,640	29,543
2	2003	53,483	14,440	8,022	31,020
3	2004	56,157	15,162	8,424	32,571
4	2005	58,965	15,920	8,845	34,200
5	2006	61,913	16,717	9,287	35,910
6	2007	65,009	17,552	9,751	37,705
7	2008	68,259	18,430	10,239	39,590
8	2009	71,672	19,351	10,751	41,570
9	2010	75,256	20,319	11,288	43,648
10	2011	79,018	21,335	11,853	45,831
11	2012	82,969	22,402	12,445	48,122
12	2013	87,118	23,522	13,068	50,528
13	2014	91,474	24,698	13,721	53,055
14	2015	96,047	25,933	14,407	55,708
15	2016	100,850	27,229	15,127	58,493
16	2017	105,892	28,591	15,884	61,418
17	2018	111,187	30,020	16,678	64,488
18	2019	116,746	31,521	17,512	67,713
19	2020	122,584	33,098	18,388	71,098
20	2021	128,713	34,752	19,307	74,653

Administrative management, economic and financing modalities of SWM services

The current system is complex and does not allow for full cost accounting and accurate per-unit costing. As mentioned in the prior section, residential costs include some servicing of commercial customers. The costs are recorded as residential, but the billing and revenue for those customers are recorded as commercial revenue. Similarly, waste fee revenue pay for the overall collection and disposal, operating and maintenance costs, capital equipment and capital development costs are not covered. The breakdown of the costs shows that some activities are heavily subsidized by others. Actual cost for the provision of this service is not reflected.

Shared and participatory management (municipality, community, NGOs)

The islands are known as a tax haven, there are no taxes on gasoline, property or sales for example and the garbage fees as outlined above is fixed and is not charge against waste produced or put out. The DEH offers waste collection and disposal, as a service, even though the administration and operation costs associated with this service is not financed by applicable revenues. The management of the landfill, container provision and servicing along with procurement of equipment and fleet and accompanying maintenance are major capital and recurring expenditures.

Despite some resistance to the charging of garbage fees, the public is made to understand the DEH's position, through various public education strategies. Assuming an average of 4lbs. per person per day x 4 persons per household, the average annual collection cost per household is CI \$325 (US\$260). The disposal cost per household is CI \$47 (US\$37.6). The total cost per household for collection and disposal of waste per year is CI \$372 (US\$297.60) .

6. STRENGTHS AND CRITICAL ASPECTS OF THE SECTOR

Factors that limit or increase the effectiveness and efficiency of solid waste management services.

The ability to recycle materials is limited on the island. Many items, which are recycled in North America, cannot be recycled in the Cayman Islands because it is not cost effective to do so. This is one factor that limits the effectiveness of using recycling as a means of solid waste management.

Annual bulk waste cleanups are conducted most years in an effort to assist residents of disposing of used appliances, derelict vehicles, old furniture, and yard waste. Residents are also educated on landfill hours and the availability of a public drop-off at the George Town landfill.

In terms of solid waste education, there are various factors that increase the effectiveness of recycling participation. The island's large expatriate population consists of individuals who are from countries where recycling is well established and practised. As a result they expect similar recycling programs running on the islands. Through education local residents are becoming more accepting of the idea of recycling. Overall participation continues to increase.

Aggressive recycling education is carried out in an effort to divert the island's recyclables from the landfill. Items presently recycled on the islands include aluminium beverage cans, lead acid batteries, office paper, natural Christmas trees, used motor oil, and leaf and yard waste. The Department of Environmental Health (DEH) works on a regular basis with the local telephone company Cable & Wireless, to recycle old phone books. The phone book recycling program coincides with the distribution of the new telephone books.

DEH has a recycling hotline for inquiries on the department's recycling programs. Also, press releases, television appearances, and newspaper advertisements are prepared and conducted in an effort to promote programs. Promotion in schools is carried out with the use of two mascots to assist in the education about solid waste management, "Igggy" the recycling iguana, and "Grabbit" the anti-littering crab. Brochures on solid waste management and other environmental health issues are distributed at various sites throughout Grand Cayman and Cayman Brac. Solid Waste Management during hurricane is also promoted. Solid waste management education is continually being expanded with the purchase of educational materials such as videos and books.

New environmental health campaigns and programs are introduced on a regular basis to coordinate with International observance days such as World Environment Day, World Water Day, and World Health Day.

7. RELATION OF SOLID WASTE MANAGEMENT SERVICES TO HEALTH, ENVIRONMENT, ECONOMIC AND SOCIAL DEVELOPMENT

The Department of Environmental Health has a policy on the investigation of an outbreak of food or water borne diseases. According to the Department an outbreak is when two or more linked cases of the same illnesses occur, where the observed number of cases exceeds the expected number, a suspected, anticipated or actual incident involving microbial or chemical contamination of food or water and /or a single case of certain diseases such as typhoid, botulism or cholera occurs.

Occupational health of formal and informal workers involved in collection and transportation.

Public education is carried out to ensure the safety of collection crew. Residents are educated on proper garbage enclosures, ways to put out and secure their garbage, and regular collection schedule.

The Chief Environmental Health Officer (CEHO) and the Assistant Director of Environmental Health (ADEH) are responsible for ensuring the policy is followed. In addition the Environmental Health Officer (EHOs) and the Senior Research Officers must ensure compliance with the policy and that all samples are analysed promptly and results relayed as soon as possible. The procedure is as follows:

- CEHO receives information from MOH
- Informs ADEH, EHO'S, SRO
- Decides if it is an outbreak, if so Outbreak Control Policy is followed
- Briefing of relevant staff
- Investigating Officer liase with Public Health Nurse
- EHO contacts affected persons
- Completes case history form
- SRO arrange food and water sample kits
- EHO visit implicated food premises immediately
- Food & water samples and swabs taken
- Details of staff illnesses, arrange for faecal kits
- Inform CEHO if suspects notifiable disease
- EHO compiles report for CEHO
- CEHO provides report for MOH

8. PARTICIPATORY MANAGEMENT IN SOLID WASTE MANAGEMENT

The community is mobilized at various times throughout the year to engage in various campaigns.

The anti-littering campaigns consist of island-wide cleanups in conjunction with various organizations. The Department of Environmental Health (DEH) has extended Earth Day to a week long of activities to bring environmental awareness and consciousness to the islands. Major cleanup campaigns also take place during Earth Week each year. DEH works with DoE, the Cayman Islands Chamber of Commerce, the National Trust of the Cayman Islands, and the Cayman Islands Tourism Association (CITA) to organize Earth Day. Hundreds of volunteers from all sectors of the community - schools, businesses, NGO's, and community groups turn out each year for Earth Week cleanup activities on the three islands. Hundreds of bags of litter are collected with some materials processed for recycling. The International Coastal Cleanup is another anti-littering campaign and is organised on the island each year by the Cayman Islands Tourism Association (CITA). The coastal cleanup consists of beach and underwater cleanup of debris. Data on debris found is collected and submitted to the USA Conservatory. DEH also work in conjunction with local radio stations, local businesses, community groups, and schools in organizing various cleanup activities.

Recycling clubs at the various high schools work with DEH on solid waste awareness. The John Gray High School Recyclers along with DEH present a float in the annual Pirates Week parade. The float highlights ongoing recycling and anti-littering activities.

Schools are contacted at the beginning of each school year and reminded to use DEH as a resource in promoting environmental issues. The public education and promotions officer conduct regular presentations on recycling and anti-littering. The Solid Waste Awareness Curriculum made by DEH and approved by the Department of Education, is incorporated into social science classes in all schools at all levels. The curriculum consists of lesson plans that promote responsible solid waste practices. DEH colouring books "Get a Grip on Litter" and "Recycle with Iggy" are distributed as well to all primary schools on the three islands. When requested, environmental health officers conduct presentations on various environmental health topics such as hygiene and sanitation. DEH also carry out tours of the George Town Landfill and the DEH Lab. Recycling and anti-littering messages are delivered to summer camps when schools are out of session.

The local media is used to get out the anti-littering and recycling message. Advertisements, public service announcements, media interviews, are some examples of what's done. DEH participates on a regular basis in fairs held throughout the year by having display booths at these fairs. Educational materials on various aspects of environmental health are distributed at these fairs and public awareness is increased through the displays and quizzes. Giveaways help generate the public's interest.

9. FUTURE PROSPECTIVES

The Alternative System Analysis Report- 2001, a study designed to characterise the existing solid waste system and to educate members of the public and government as to possible future alternatives, in order to promote an informed discussion of solutions, identified several diverse ways to proceed, all of which have their own benefits. The debate therefore lends itself to open discussion and to selecting the system most consistent with the culture and needs of the Cayman Islands.

The government need to adopt the following approaches to ensure sustainability of solid waste management options.

- Municipal Solid Waste Discontinue the non-engineered land filling practice as soon as practical and identify sites for an engineered landfill in another location. Construct a transfer station at the closed George Town Landfill to reduce trucking to a more remote location and to provide a centrally located drop - off area.
- All available resources should be allocated to the establishment of a new landfill. The ASA determined that a landfill would be required in all of the proposed waste management alternatives.
- The billing system should attempt to match the activity costs directly to the revenues from those activities. The full cost accounting method should be utilized to enable a billing system that account for both fixed costs and for variable costs that depend on the volume of trash handled and disposed of, and then determine a pricing structure that will cover all these costs. The price structure, in turn, will have a large impact on waste generation, revenues and cost.
- Should Government decide to privatise any portion of the solid waste system, full cost accounting, inclusive of capital equipment, will allow it to be prepared, among other things, to plan and budget accurately for the pieces of the program that will remain in government hands, such as management/administration, consumer education, enforcement and provision of drop off services.
- A tipping fee at the landfill should be instituted. Approximately 31% of the annual MSW tonnage entering the landfill for disposal is not paid for, because the disposal fees are included in the collection fees.
- Purchase as much acreage as possible for the landfill site. At a minimum, 72 acres should be purchased: 39 acres for the waste cells, 18 acres for borrow area, and 15 acres for support and buffer area. One hundred to two hundred acres are preferable.
- Amend the 1997 Development Plan. The amendment must be approved by the Legislative Assembly. Apply for a rezone. Define zoning category for engineered landfills.
- Adopt a more comprehensive legislation governing the management of solid waste.
- Determine what entity will be responsible for the management of waste in the future. Depending upon whether significant financial reform progresses, consider the formation of a waste authority or the privatization of waste services.
- Biomedical waste - continue to utilize the existing biomedical waste incinerator until the growth in biomedical waste volumes exceeds its capacity.
- Hazardous waste - the waste management entity, whether a government department or an authority, will continue to manage hazardous wastes either in a regulatory capacity or as service provider. Adopt, also, a legislation governing the management of hazardous wastes.

- Allowances for Private Investment a determination should be made as to what aspect of the chosen solid waste system should be privatized.
- Review existing legislation to determine whether amendments are required to allow for privatization of solid waste services.
- Recycling the current programs, aforementioned, should be continued and expanded where applicable.
- Consideration should be given to implementing a deposit system for bottles and aluminium cans in order to increase the amount of these materials for recycling and to reduce the amount of roadside litter.
- Commercial Collection the systems currently in place for commercial waste collection is to continue. The move toward replacement of individual bins, skiffs and rear - loading containers with front - loading containers for commercial establishments should continue.
- The increased use of self - contained compactor units will also result in increased efficiency.

Overall, there are numerous attempts to improve solid waste management services in the Cayman Islands. The approach has been to implement changes in Grand Cayman then make the natural transition to the smaller islands. Similar to other services it is an increase in capital investment and a sustained will of government and local authorities that will really drive the process. The government of the Cayman Islands endeavours to provide an efficient and reliable service to its citizens while ensuring a clean environment.

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11. ACRONYMS

CI	Cayman Islands
DEH	Department of Environmental Health
P, C, W&IT	Ministry of Planning, Communications, Works and Information Technology
MSW	Municipal Solid Waste
SWM	Solid Waste Management
SWA	Solid Waste Authority
US	United States

12. WORKING TEAM

Sincere thanks are expressed to the following persons who gave of their valuable time, knowledge, and experience:

- Mr. Roydell Carter - Director, Environmental Health
- Miss Shannon Mckenzie - Public Education and Promotions Officer, Dept. Environmental Health.
- Mr. Ronald Dilbert, Assistant Manager -Solid Waste, George Town Landfill
- Mssrs. David Connelly and Rohan Lawrence - George Town Landfill, Grand Cayman.
- Mr. Trevor Jones - Landfill Manager, Cayman Brac

Thanks also to the entire staff members of the Department of Environmental Health, who were extremely helpful and without their support much of the tasks undertaken would not have been successful, more importantly Mrs. Leonie William - Brown and Mr. Bentley Vaughn.